

VACUUM FLUORESCENT DISPLAY MODULE

ENGINEERING PROPOSAL

GP1112A03D

EVALUATION

- ACCEPTED WITHOUT ANY CHANGE
 THE FOLLOWING CHANGE IS REQUIRED

7 January 2009

VFD MODULE GROUP

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Important Safety Notice

Please read this note carefully before using the product.

Warning

- The module should be disconnected from the power supply before handling.
- The power supply should be switched off before connecting or disconnecting the power or interface cables.
- The module contains electronic components that generate high voltages which may cause an electrical shock when touched.
- Do not touch the electronic components of the module with any metal objects.
- The VFD used on the module is made of glass and should be handled with care. When handling the VFD, it is recommended that cotton gloves be used.
- The module is equipped with a circuit protection.
- Under no circumstances should the module be modified or repaired. Any unauthorized modifications or repairs will invalidate the product warranty.
- The module should be abolished as the factory waste.

1. FEATURES

FUTABA GP1112A03D is a graphic display module using a FUTABA 128×32dots VFD.

It consists of a control ASIC with internal Static-RAM of 2320bytes, character generator ROM and power source.

The module can be connected directly to the bus-line of the host system CPU.

2. GENERAL DESCRIPTION

2-1. DIMENSIONS, WEIGHT (Refer to FIGURE-1)

Table-1

Item	Specification	Unit
Outer dimensions	(W) 88±1	mm
	(H) 44±1	
	(T) 20.7 MAX.	
Weight	Approx. 65	g

2-2. SPECIFICATIONS OF THE DISPLAY PANEL

Table-2

Item	Specification	Unit
Display Area	57.5(W)×14.3(H)	mm
Number of Dots	128×32	Dot
Dot Size (H×W)	0.35×0.35	mm
Dot Pitch (H×W)	0.45×0.45	mm
Color Illumination	Green ($\lambda_p=505\text{nm}$)	—
Luminance	500 (Typ)	cd/m ²

Note) By using a filter, uniform color range from blue to orange (including white) can be obtained.

2-3. ENVIRONMENT CONDITIONS

Table-3

Item	Symbol	Min.	Max.	Unit
Operation Temperature	<i>T_{opr}</i>	-40	+85	°C
Storage Temperature	<i>T_{stg}</i>	-40	+85	°C
Operating Humidity	<i>H_{opr}</i>	20	85	%
Storage Humidity	<i>H_{stg}</i>	20	90	%
Vibration (10 ~ 55Hz)	—	—	4	G
Shock	—	—	40	G

Note) Avoid operations and or storage in moist environmental conditions.

2-4. ABSOLUTE MAXIMUM RATINGS

Table-4

Item	Symbol	Min.	Max.	Unit
Supply Voltage	V_{CC}	-0.3	6.0	Vdc
Input Signal Voltage	V_{IS}	-0.3	$V_{CC}+0.3$	V

2-5. RECOMMEND OPERATING CONDITIONS

Table-5

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	Vdc
H-Level Input Voltage	V_{IH}	2.6	—	—	V
L-Level Input Voltage	V_{IL}	—	—	0.7	V

2-6. ELECTRICAL CHARACTERISTICS

Table-6

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Current (Note1)	I_{CC}	$V_{CC} = 5.0\text{Vdc}$ All on	—	400	600	mA
Power Consumption	—		—	2	3	W
Luminance	L		250	500	—	cd/m ²
H-Level Output Voltage	V_{OH}	$V_{CC} = 4.5\text{Vdc}$ $I_{OH} = -2\text{mA}$	3.6	—	—	V
L-Level Output Voltage	V_{OL}	$V_{CC} = 4.5\text{Vdc}$ $I_{OL} = 3.2\text{mA}$	—	—	0.5	V

Note) The surge current can be approx. 5 times the specified supply current at power on.

3. BASIC FUNCTION

- 3-1. Function Table
- 3-2. Function of Signal Lines
- 3-3. Command Table
- 3-4. Relationship of The Display Area to Address and Data
- 3-5. Function of Commands

3-1. Function Table

Table-7

$\overline{\text{CS}}$	$\overline{\text{WR}}$	$\overline{\text{RD}}$	$\text{C}/\overline{\text{D}}$	MODE
L	↑	H	H	Command Write-in
L	↑	H	L	Data Write-in
L	H	L	H	—
L	H	L	L	Data Read-out

3-2. Function of Signal Lines

Table-8

Signal	I/O	Function
D0~D7	I/O	8bit Data Bus
$\overline{\text{WR}}$	I	Write Signal
$\overline{\text{RD}}$	I	Read Signal
$\overline{\text{CS}}$	I	Chip Select Signal
$\text{C}/\overline{\text{D}}$	I	Command / Data Select Signal C/ $\overline{\text{D}}$ ="H" : Command C/ $\overline{\text{D}}$ ="L" : Data Write and Data Read
INT	O	Frame Signal (One output pulse per one display frame)
Vcc1	—	+5V
GND	—	GND

3-3. Command Table

The followings are all commands of this module.

Table-9

Command (C/ \bar{D} ="H")	Setting Data (C/ \bar{D} ="L")	Function	Default Select
00H	—	Screen 1 & Screen 2 are Displayed off	○
01H	—	Screen1 is Displayed on	
02H	—	Screen2 is Displayed on	
03H	—	Screen 1 & Screen 2 are Displayed on	
04H	—	Read/Write address is automatically incremented	○
05H	—	Read/Write address is held	
07H	D0~D7	Character code write-in	
08H	D0~D7	Display data write-in	
09H	D0~D7	Display data read-out	
0AH	D0~D7	Setting lower address for Screen 1 started	00H
0BH	D0~D3	Setting upper address for Screen 1 started	00H
0CH	D0~D7	Setting lower address for Screen 2 started	00H
0DH	D0~D3	Setting upper address for Screen 2 started	00H
0EH	D0~D7	Setting lower address of Read/Write	00H
0FH	D0~D3	Setting upper address of Read/Write	00H
10H	—	OR display of Screen 1 & 2	○
11H	—	EX-OR display of Screen 1 & 2	
12H	—	AND display of Screen 1 & 2	
13H	D0~D7	Brightness Adjustment	00H
14H	D0~D7	Setting of display mode ※1	00H

Note) "—" in the above table is shown that the setting data is not needed.

※1) Setting data has to be set 20H.

3-4. Relationship of The Display Area to Address and Data

The following map is shown in case of 000H or display start address.

The actual display area is the part of enclosing with the solid line of FIG.1 and FIG.2.

FIG.1 & FIG.3 indicate the map at start address to set to 000H.

64-57	56-49	48-41	40-33	32-25	24-17	16-9	8-1	1	2	3	126	127	128	129	288	289	290
D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7
007	006	005	004	003	002	001	000	000	000	008	3E8	3E8	3E8	400	8F8	8F8	908
00F	00E	00D	00C	00B	00A	009	008	008	008	008	3E8	3E8	3E8	400	8F8	8F8	908
017	016	015	014	013	012	011	010	010	010	010	3E8	3E8	3E8	400	8F8	8F8	908
											3E8	3E8	3E8	400	8F8	8F8	908
											3E8	3E8	3E8	400	8F8	8F8	908
3EF	3EE	3ED	3EC	3EB	3EA	3E9	3E8	3E8	3E8	3E8	3E8	3E8	3E8	400	8F8	8F8	908
3F7	3F6	3F5	3F4	3F3	3F2	3F1	3F0	3F0	3F0	3F0	3F0	3F0	3F0	400	8F8	8F8	908
3FF	3FE	3FD	3FC	3FB	3FA	3F9	3F8	3F8	3F8	3F8	3F8	3F8	3F8	400	8F8	8F8	908
407	406	405	404	403	402	401	400	400	400	400	400	400	400	400	8F8	8F8	908
											400	400	400	400	8F8	8F8	908
											400	400	400	400	8F8	8F8	908
8FF	8FE	8FD	8FC	8FB	8FA	8F9	8F8	8F8	8F8	8F8	8F8	8F8	8F8	8F8	8F8	8F8	908
907	906	905	904	903	902	901	900	900	900	900	900	900	900	900	900	900	900
90F	90E	90D	90C	90B	90A	909	908	908	908	908	908	908	908	908	908	908	908

FIG.1 Position of display dot to address and data

64-57	56-49	48-41	40-33	32-25	24-17	16-9	8-1	1	2	3	4	126	127	128	129	288	289	290
D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7	D0-D7
907	906	905	904	903	902	901	900	900	900	900	900	3D8	3E0	3E8	3F0	8E8	8F0	8F8
90F	90E	90D	90C	90B	90A	909	908	908	908	908	908	3D8	3E0	3E8	3F0	8E8	8F0	8F8
007	006	005	004	003	002	001	000	000	000	000	000	3D8	3E0	3E8	3F0	8E8	8F0	8F8
00F	00E	00D	00C	00B	00A	009	008	008	008	008	008	3D8	3E0	3E8	3F0	8E8	8F0	8F8
												3D8	3E0	3E8	3F0	8E8	8F0	8F8
3DF	3DE	3DD	3DC	3DB	3DA	3D9	3D8	3D8	3D8	3D8	3D8	3D8	3D8	3D8	3D8	3D8	3D8	3D8
3E7	3E6	3E5	3E4	3E3	3E2	3E1	3E0	3E0	3E0	3E0	3E0	3E0	3E0	3E0	3E0	3E0	3E0	3E0
3EF	3EE	3ED	3EC	3EB	3EA	3E9	3E8	3E8	3E8	3E8	3E8	3E8	3E8	3E8	3E8	3E8	3E8	3E8
3F7	3F6	3F5	3F4	3F3	3F2	3F1	3F0	3F0	3F0	3F0	3F0	3F0	3F0	3F0	3F0	3F0	3F0	3F0
												3F0	3F0	3F0	3F0	3F0	3F0	3F0
												3F0	3F0	3F0	3F0	3F0	3F0	3F0
8EF	8EE	8ED	8EC	8EB	8EA	8E9	8E8	8E8	8E8	8E8	8E8	8E8	8E8	8E8	8E8	8E8	8E8	8E8
8F7	8F6	8F5	8F4	8F3	8F2	8F1	8F0	8F0	8F0	8F0	8F0	8F0	8F0	8F0	8F0	8F0	8F0	8F0
8FF	8FE	8FD	8FC	8FB	8FA	8F9	8F8	8F8	8F8	8F8	8F8	8F8	8F8	8F8	8F8	8F8	8F8	8F8

FIG. 2 Indicate the map at start address to set to 900H

	ADDRESS							
D7	0	0	0	0	0	0	0	0
D6	0	0	1	1	2	2	3	3
D5	0	8	0	8	0	8	0	8
D4	H	H	H	H	H	H	H	H
D3								
D2								
D1								
D0								
DATA								
1	1	2	4	2	1			
F	F	4	4	4	F			
H	H	H	H	H	H			

FIG.3 Data Write-in

3-5. Function of Commands

3-5-1. Screen Display on / off Control (00H, 01H, 02H, 03H)

The latest command becomes effective.

At power on, screen 1 and 2 are set to Display off mode.

Therefore, the Display on mode command should be written in, after display pattern data input.

In case of executing Display on mode before display data input at initial, random pattern may be displayed.

3-5-2. Setting of Write Address Mode (04H, 05H)

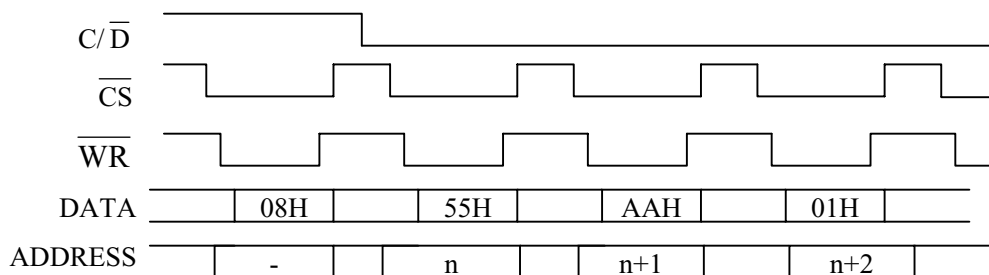
These commands select either the write or read address is incremented by single step automatically or is held after data write and data read.

When a memory address is set to 90FH, next memory address is set to 000H.

3-5-3. Data Write (08H)

After executing the Write address setting command, this command shall be executed.

The following indicate the display data 55H, AAH and 01H write-in.

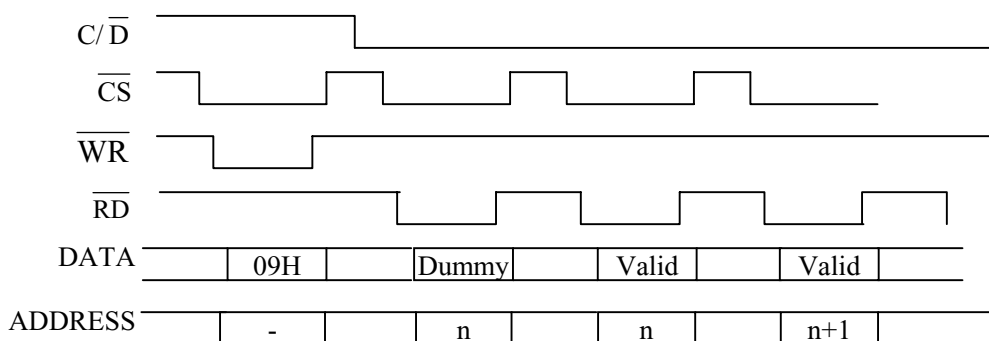


3-5-4. Data Read (09H)

After executing the Read address setting command, this command shall be executed.

Dummy read is necessary. The correct data can be read from the second byte.

The following indicate the display data read out.



3-5-5. Setting of Display Start Address (0AH, 0BH, 0CH, 0DH)

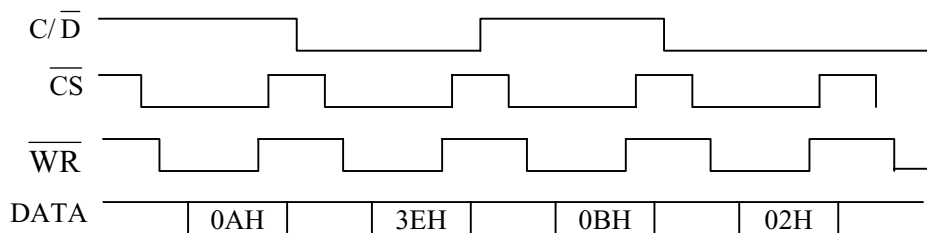
The display start address is just pointed to the left and top line of the display area.

Screen 1 and 2 can be independently set the display start address each other.

This address is divided to the two portions with upper (five bits) and lower (eight bits) address, and lower address shall be set first, then set the upper address.

The smooth scroll of displaying can be achieved by synchronizing with the change of display address by the INT signal at every frame.

The following indicate the display start address of screen1 to set to 23EH.



3-5-6. Setting of Write/Read Address (0EH, 0FH)

This command is set the write/read address of displaying data.

This address is divided the two portions with upper (five bits) and lower (eight bits) address, and lower address shall be set first, then set the upper address.

Only the upper address is available to be changed independently.

When the lower address is changed, it is required to change the both address.

3-5-7. Screen OR / EX-OR / AND Display Select (10H, 11H, 12H)

The latest command becomes effective.

3-5-8. Luminance Adjustment (13H)

Write-in data (64H~00H) allows luminance to be adjusted.

When the module is turned on, it is set to dimming level 100%.

Table-10

Input Data	Luminance
FFH~64H	0% (Display blank)
50H	20%
46H	30%
3CH	40%
32H	50%
28H	60%
1EH	70%
14H	80%
0AH	90%
00H	100% (Max)

*1: Write-in data (FFH~64H) allows luminance to be 0%.

*2: Write-in data is available from 00H to 50H.

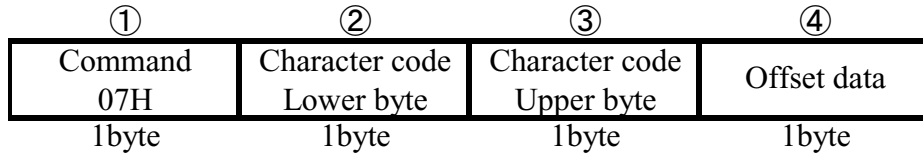
*4: Write-in data (51H~63H) prohibits.

3-5-9. Setting of display mode (14H)

When the module is turned on, it has to be written 20H after this command data (14H) is sent to a module. ※Do not write an other data instead of 20H.

3-5-10. Character Code Write-in (07H)

By using this command, a character of a font ROM can be displayed.



- ① Write command 『07H』
- ② Write lower byte character code data.
- ③ Write upper byte character code data.
- ④ Write offset data.

Note) Write continuously from ① to ④.

3-5-11. Setting of Character Code

Lower byte (c1~c7) shall be set first, then set the upper byte (c8 and d1~d5).

The below table is the relationship between c1~c8, d1~d5 and write-in data D7~D0 bit.

Lower byte								Upper byte							
D7	D6	D5	D4	D3	D2	D1	D0	D7	D6	D5	D4	D3	D2	D1	D0
—	c7	c6	c5	c4	c3	c2	c1	—	—	d5	d4	d3	d2	d1	c8
0	*	*	*	*	*	*	*	0	0	*	*	*	*	*	*

* : Select by character code.
0 : Set to 『0』

The following is for example to be displayed 『漢字』 characters with 16×16 dot format.

Character code of 『漢』 is 41H(lower byte) and 04H(upper byte).

Character code of 『字』 is 7AH(lower byte) and 0BH(upper byte).

	Lower byte								Upper byte							
	D7	D6	D5	D4	D3	D2	D1	D0	D7	D6	D5	D4	D3	D2	D1	D0
	—	c7	c6	c5	c4	c3	c2	c1	—	—	d5	d4	d3	d2	d1	c8
漢	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0
字	0	1	1	1	1	0	1	0	0	0	0	0	1	0	1	1

- ① 『漢』 character is displayed.
07H(command)→41H(lower data)→04H(upper data)→48H(offset data)
- ② 『字』 character is displayed.
07H(command)→7AH(lower data)→0BH(upper data)→48H(offset data)

3-5-12. Setting of Font Size

Font size can be selected by setting a offset data.

The table-11 indicates the relationship between a offset data and font size.

Table-11

Offset Data	Font Size	The Number of Read-out Bytes	Note	Conversion Time (uS) (*2)
00H	24×24 dots	72	—	65
80H (*1)	12×24 dots (Half size of 24×24)	32	—	34
48H	16×16dots	32	—	30
C8H (*1)	8×16 dots (Half size of 16×16)	16	—	16
68H (*3)	5×7 dots	5	Japanese-font type Alphabet, Numerals, Katakana	6
70H (*3)	5×7 dots	5	Japanese-font type European-font type Alphabet, Numerals,	6

*1: When a half size letter is displayed, D7 bit of a offset data is set to "1".

*2: It indicates the time to complete the conversion of character generator ROM data after the command data is write-in.

And the command of 08H, 0EH and 0FH are ignored within this conversion time.

*3: The 5×7 dot format can be confirmed by character code table (9) to (24).

3-5-13. Conversion table from JIS Code to a Character Code

The following indicates the data exchange from JIS code to a character code.

Classification (JIS code)	b7	b6	b5	Upper byte								Lower byte							
				-	-	d5	d4	d3	d2	d1	c8	-	c7	c6	c5	c4	c3	c2	c1
Alphabet and Numerals	0	1	0	0	0	0	a7	a6	b3	b2	b1	0	0	0	a5	a4	a3	a2	a1
Kanji (level 1)	0	1	1	0	0	0	b7	b4	b3	b2	b1	0	a7	a6	a5	a4	a3	a2	a1
Kanji (level 1)	1	0	0	0	0	0	b7	b4	b3	b2	b1	0	a7	a6	a5	a4	a3	a2	a1
Kanji (level 2)	1	0	1	0	0	1	b6	b4	b3	b2	b1	0	a7	a6	a5	a4	a3	a2	a1
Kanji (level 2)	1	1	0	0	0	1	b6	b4	b3	b2	b1	0	a7	a6	a5	a4	a3	a2	a1
Kanji (level 2)	1	1	1	0	0	1	a7	a6	b3	b2	b1	0	0	0	a5	a4	a3	a2	a1
Katakana	0	1	0	0	0	1	a7	a6	1	b3	b1	0	0	0	a5	a4	a3	a2	a1

Note 1) b7~b1 is first byte of JIS code, a7~a1 is second byte of JIS code.

Note 2) d5~d1 and c8~c1 is character code.

3-5-14. The Display Position of a Character

A character is displayed from the address where is set by the read/write address command.
When 16×16 font, 24×24 font and 5×7 font is displayed in order, the read/write address is automatically shifted as follows.

- ① The read/write address is 000H at first
- ② 16×16 font write-in → Read/Write address is shifted to 080H
- ③ 24×24 font write-in → Read/Write address is shifted to 140H
- ④ 5×7 font write-in → Read/Write address is shifted to 168H

16×16 Font				24×24 Font				5×7 Font					
1	2	15	16	17	18	19	38	39	40	41	42	45	46
000	001	002	003	070	071	072	073	078	079	080	081	128	129
008	009	00A	00B	075	076	077	078	083	084	085	086	130	131
				07A	07B	07C	07D	088	089	090	091	132	133
				07E	07F	080	081	092	093	12A	12B	134	135
										12C	12D	136	137
										12E	12F	138	139
										130	131	140	141
										132	133	142	143
										134	135	144	145
										136	137	146	147
										138	139	148	149
										140	141	160	161
										142	143	162	163
										144	145	164	165
										146	147	166	167
										148	149	168	169
										150	151		
										152	153		
										154	155		
										156	157		
										158	159		
										160	161		
										162	163		
										164	165		
										166	167		
										168	169		

Note 1) A character is displayed from the position of the latest address by read/write address setting command.

Note 2) Read/Write address is shifted by offset data (font size).

Note 3) Even if 05H command mode is selecting, read/write address is shifted.

〈Other note〉

- (1). The characters from 0000H to 021FH in character code table (1) can only be displayed by half-size letter code.
And it becomes blank display at the right half area if it is set by full-size letter code.
- (2). The half-letter katakana characters from 2500H to 261FH in character code table (5) can only be displayed.
A half-letter hiragana character can not be displayed properly.
- (3). The half-letter katakana characters (24×12 , 16×8) from 2700H to 271FH in character code table (5) can only be displayed.
The 5×7 dot format character can not be displayed.

4. INTERFACE CONNECTION

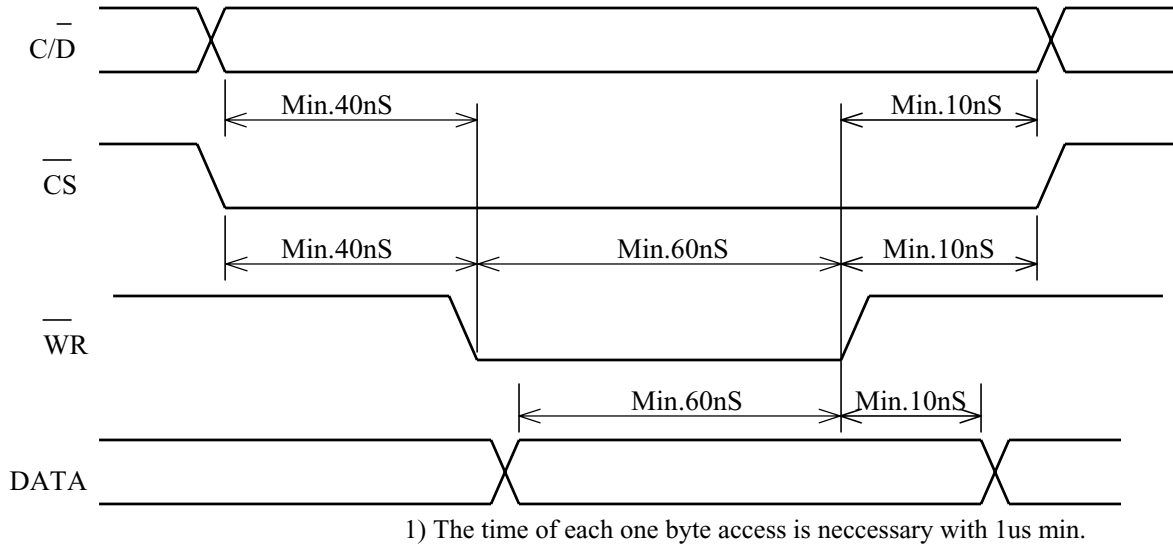
Connector : 52610-2071 (MOLEX)
1mm Pitch 20pin FFC connector

Table-12

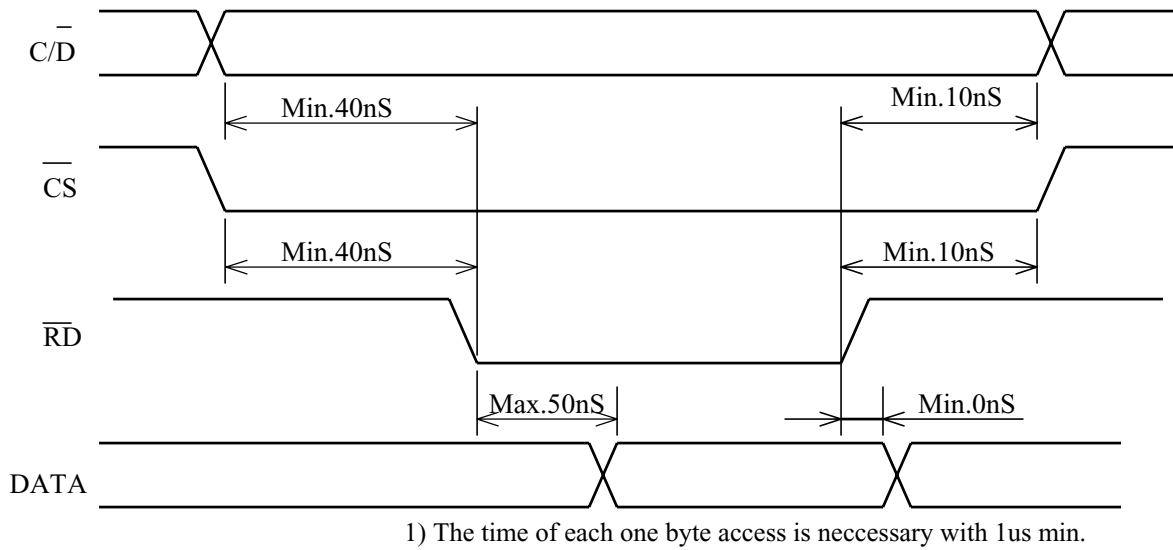
Pin No.	Description	Pin No.	Description
1	D0	2	D1
3	D2	4	D3
5	D4	6	D5
7	D6	8	D7
9	GND	10	INT
11	$\overline{\text{WR}}$	12	$\overline{\text{RD}}$
13	$\overline{\text{CS}}$	14	$\text{C}/\overline{\text{D}}$
15	Vcc	16	Vcc
17	Vcc	18	GND
19	GND	20	N.C

5. TIMING CHART

5-1. Write-in timing

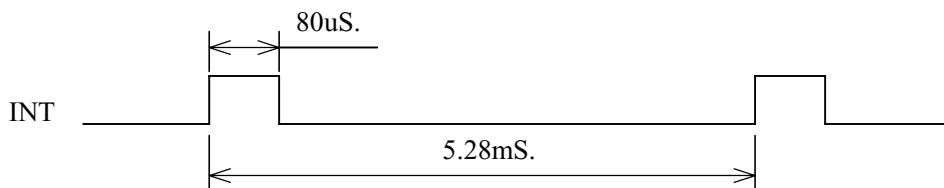


5-2. Read-out timing



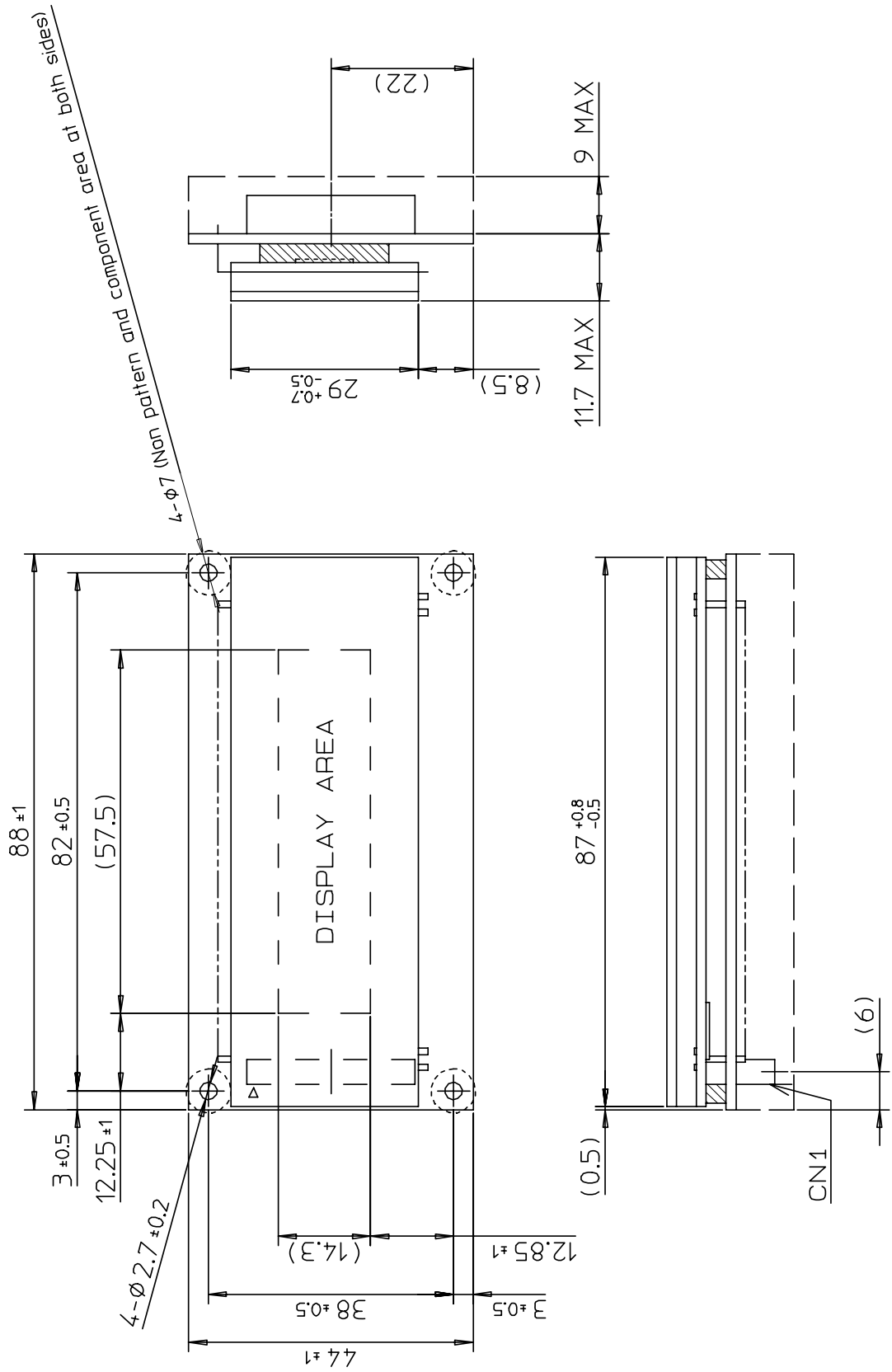
5-3. INT timing

The module generates 80usec of INT signal at every 5.28msec of refresh timing.
 Display start address should be executed during period of INT = "H" for smooth scroll.



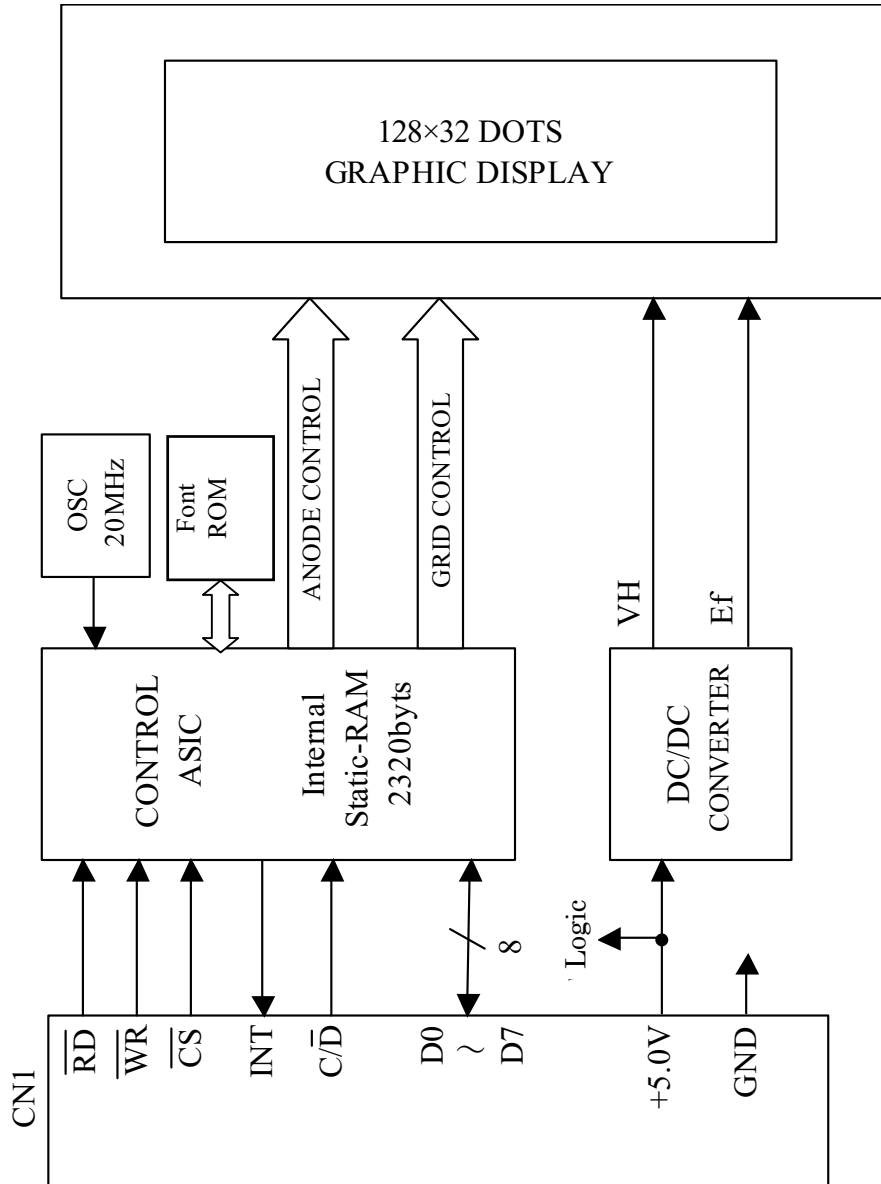
6. OUTER DIMENSION

FIGURE-4



7. CIRCUIT BLOCK DIAGRAM

FIGURE-5



8. CAUTIONS FOR OPERATION

- 8-1. Applying lower voltage than the specified may cause non activation for selected pixels.
Conversely, higher voltage may cause non-selected pixel to be activated.
If such a phenomenon is observed, check the voltage level of the power supply.
- 8-2. The DC/DC converter generates approximately 60Vdc, avoid touching it with bare hands, or to other circuits.
- 8-3. Avoid using the module where excessive noise interface is expected.
Noise affects the interface signal and causes improper operation.
Keep the length of the interface cable less than 30cm.
(When the longer cable is required, please confirm there is no noise affection.)
- 8-4. When power is turned off, the capacitor will not discharge immediately.
Avoid touching IC and others.
The shorting of the mounted components within 30 sec., after power off, may cause damage.
- 8-5. When fixed pattern is displayed for a long time, you may see uneven luminance.
It is recommended to change the display patterns sometimes in order to keep best display quality.
- 8-6. DC/DC converter is equipped on the module, the surge current may be approximately 5 times the specified supply current at the power on.

Character Code Table(3)

d5=0	c7	c6	c5	c4	c3	c2	c1	1																																														
								0																																														
								64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95															
								d4	d3	d2	d1	c8	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31										
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Character Code Table(17)

The 5x7 dot format (Offset Data: 70H)

d5=0					c7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
					c6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
					c5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
					c4	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	
					c3	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	
c2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	1						
c1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0						
d4	d3	d2	d1	c8		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
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0	0	0	1	0	2			`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	{		}	~	■
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0	0	1	0	0	4																																		
0	0	1	0	1	5																																		
0	0	1	1	0	6																																		
0	0	1	1	1	7																																		
0	1	0	0	0	8																Г	Г																	
0	1	0	0	1	9																																		
0	1	0	1	0	10																																		
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0	1	1	0	0	12																																		
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1	0	1	1	1	23					А	Е	У	У	А	Е	І	О	О	А	Е	Ж	Е	Ж	Б	Г	Д	Ж	Ж	З	И	И	Л							
1	1	0	0	0	24																																		
1	1	0	0	1	25																																		
1	1	0	1	0	26																С	С	Р														К	К	
1	1	0	1	1	27																																		
1	1	1	0	0	28																														Ю	Ю	У	Ю	Ф
1	1	1	0	1	29																													Э	У	А	І	Ю	Ф
1	1	1	1	0	30																																		
1	1	1	1	1	31	П					У	Ф		Ц	Ч	Ш	Щ	Ъ	Ы		Э	Ю	Я	С	Ю	Е	А	А	А	С	А	Е	І	І	І	Ю	Ю		

